STATE OF CALIFORNIA
HIGHWAY TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

SUPPLEMENTAL INFORMATION ON

DRYING SHRINKAGE OF MODEL CONCRETE BEAMS EXPOSED OUTSIDE

(INCLUDING THE EFFECT OF A CHEMICAL ADMIXTURE)

State of California
Highway Transportation Agency
Department of Public Works

MATERIALS AND RESEARCH DEPARTMENT

August, 1965

PWO 5046 R

Mr. L. R. Gillis
Assistant State Highway Engineer
California Division of Highways
Sacramento, California

Dear Mr. Gillis:

Submitted for your consideration is supplemental information on;

Drying Shrinkage of Model Concrete

Beams Exposed Outside

(including the effect of a chemical admixture)

Study made by . . . . . Concrete Section
Under direction of . . . . . D. L. Spellman
Work supervised by . . . . . J. H. Woodstrom
Report prepared by . . . . . F. E. Kinsman

Very truly yours,

JOHN L. BEATON
Materials and Research Engineer

cc:JEMcMahon
JFJorgensen
WHAmes
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Supplemental Information on

DRYING SHRINKAGE OF MODEL CONCRETE BEAMS EXPOSED OUTSIDE
(Including the effect of a chemical admixture)

Introduction

The original report for this project was submitted by Mr. F. N. Hveem in December, 1961, under Laboratory Authorization No. 5046 R 46, and represented data obtained over a 70-week period. Length measurements made at the cessation of the initial 7-day moist curing period were the values used as initial measurements. Subsequent measurements were made after 7, 14 and 28 days of exposure, and thereafter at intervals of 28 days. To possibly obtain additional information, measurements were continued after the 70-week period on a bi-yearly basis with readings made at the beginning and end of each drying season (May and October). Measurements were terminated in May 1965, making a total of 248 weeks of exposure since the inception of the project.

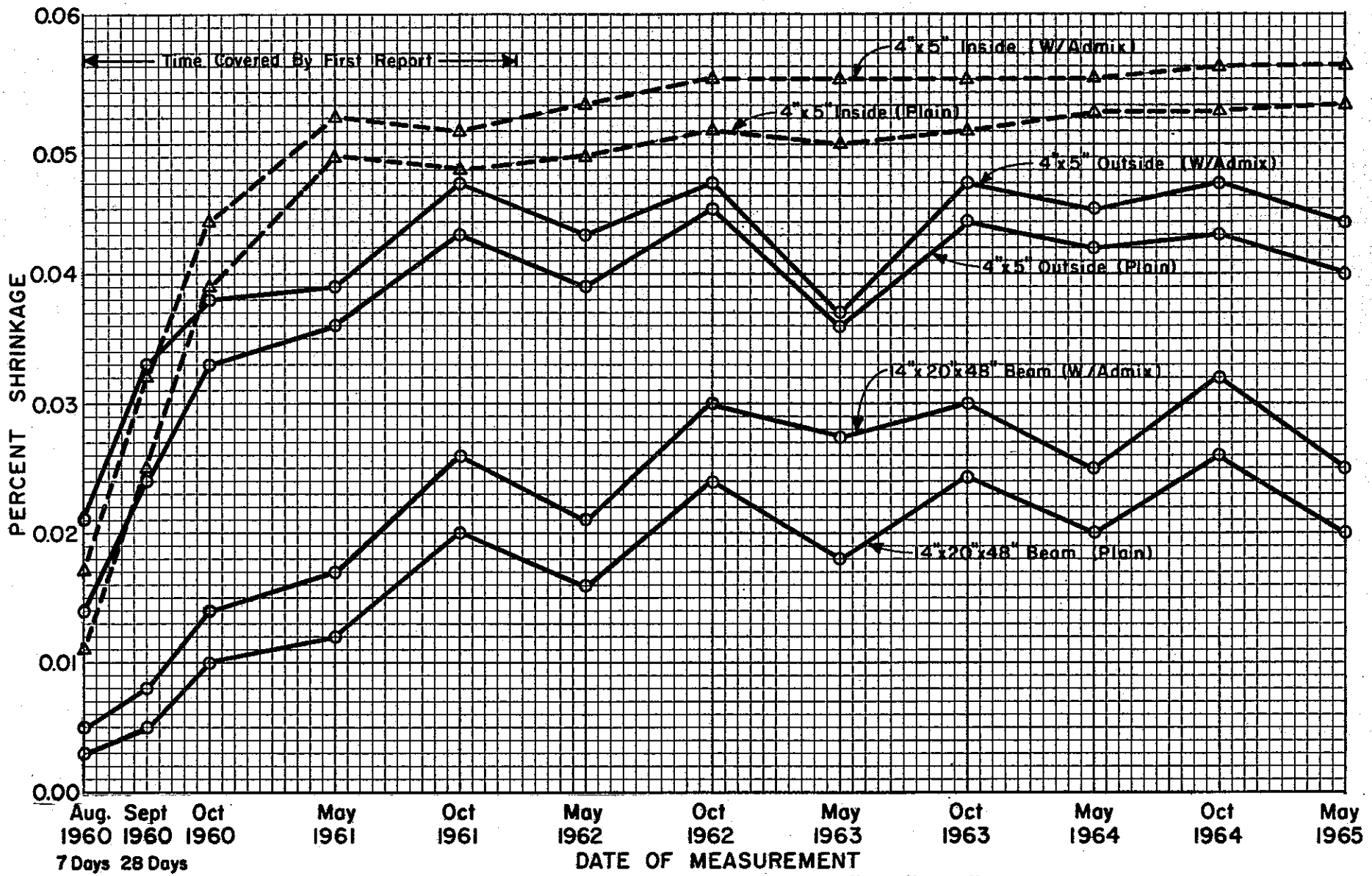
General

Measurements obtained on the beams and bars subjected to outside exposure since the 1961 report was published, indicated drying shrinkage and expansion was cyclic in nature with the alternate wetting and drying seasons. There was a slight continual increase in shrinkage up to the termination of the study. Shrinkage bars subjected to laboratory drying showed a slight gradual increase in shrinkage up to the termination of the measurements.

A graph showing the 7 and 28-day measurements with subsequent May and October measurements of the full size beams and 4x5x18-inch bars is included to demonstrate the cycling of shrinkage and expansion with the seasons.

Conclusions

Measurements made over the extended period did not indicate anything that would alter the conclusions made in the 1961 report. It had been concluded that laboratory drying shrinkage tests of customary size test specimens should be discontinued at relatively short ages. This was based on the fact that the rate at which concrete specimens lose moisture and shorten during drying is proportional to the ratio of exposed surface to volume. Under outside exposure in a climate similar to the Sacramento Valley, the length of the summer season in any year is too short to accomplish full drying and shortening of large members. Measurements indicated that shrinkage in a controlled temperature and humidity for 14 days (for 3x3x10-inch test specimens) equalled the maximum attained for the full size beams outside over the longer summer exposure period. For the 4x5x18-inch specimens, 21 to 28 days of drying under controlled laboratory conditions equalled that of the full size members outside. It was also concluded that the test for the effect of chemical admixtures on drying shrinkage of concrete performed in accordance with Test Method No. Calif. 530-A provided a reliable measure of the performance of admixtures in concrete subjected to exterior exposure.



SHRINKAGE OF BEAMS AND 4"x5"x18" BARS
CONCRETE, PLAIN AND WITH ADMIXTURE